

IN THE DRAWINGS:

The attached sheet of drawings includes changes to FIG. 4. This sheet replaces the replacement sheet filed March 1, 2006 that included FIG. 4.

REMARKS

Claims 13-16, 19, 24, 29 and 32 have been amended. Claims 13-32 remain for further consideration. No new matter has been added.

The Applicant would like to thank the Examiner for the courtesy extended in granting a telephone interview on July 19, 2006 to discuss this matter. Attorney Kosakowski and Examiner Suthers discussed the prior art and its application to the independent claims. No agreement was reached.

The Official Action is taken up in order as follows:

1-3. The drawings currently stand objected to due an alleged incorrect reference number.

A replacement drawing sheet is submitted herewith.

4-5. Claims 13, 24, 29 and 32 currently stand rejected as indefinite.

Claims 13, 24, 29 and 32 have been amended to correct the alleged indefinite language.

6-22. Claims 13-21, 24-26 and 29-32 currently stand rejected as allegedly being obvious over the combined subject matter is U.S. Patent 4,182,930 to Blackmer (hereinafter "Blackmer") and U.S. Patent 4,000,370 to Smith et al. (hereinafter "Smith").

A SKILLED PERSON WOULD NOT COMBINE BLACKMER AND SMITH

Blackmer and Smith are related to different technical problems. Blackmer relates to adding energy to the bass region of a signal (e.g., 40-100 Hz) to increase the energy associated with the bass frequency components of a signal. In contrast, Smith teaches selectively shunting an input signal in order to limit an amplified output signal value. Therefore, Blackmer is

additive (i.e., adds energy to the signal), while Smith is subtractive (i.e., reduces the energy of the signal).

The Official Action recognizes that Blackmer does not disclose a limiter (Official Action, pg. 3). The Official Action then contends that a person of ordinary skill in the art at the time of the invention would use the limiter of Smith to limit the amplified signal of Blackmer. The Official Action contends that motivation for doing so would be to avoid distortion due to overloading. The Official Action then concludes it would have been obvious to combine Blackmer and Smith to obtain the invention as specified in claim 13. It is respectfully submitted that this combination of references is improper, since a person of ordinary skill in the art would not look to Smith and Blackmer due to their dissimilar technical teachings. Specifically, the qualification circuit 26 of Blackmer checks the frequency range of interest (e.g., 40-100 Hz), and if energy in this frequency range is too low Blackmer adds energy in this frequency range to provide a bass-enhanced output signal. So Blackmer clearly addresses the problem of there being insufficient energy in a desired frequency range, rather than too much energy. In contrast, Smith relates to a system that shunts an input signal when the associated output signal becomes too large. It is respectfully submitted that a person of ordinary skill in the art at the time of the invention would not have employed the subtractive/shunting features of Smith and the additive system architecture such as Blackmer. Again, Blackmer deals with the problem of there being insufficient energy in the bass frequency range of a signal and processes the signal to add energy to the bass frequency range as needed. So a person of ordinary skill in the art would not combine the teachings of Blackmer and Smith since they solve entirely different technical problems.

IF MODIFIED AS SUGGESTED, BLACKMER NO LONGER OPERATES FOR ITS INTENDED PURPOSE

Claim 13 recites a method for processing an audio signal. The method includes the steps of:

“providing the correction factor as a feedback signal that is a function of the third intermediate signal;
band-limiting the fourth intermediate signal to generate a fifth intermediate signal; and
adding the fifth intermediate signal to the received audio signal.” (cl. 13, emphasis added).

The Official Action concludes that “[a]t the time of the invention it would have been obvious to a person of ordinary skill in the art to use the limiter of Smith to limit the amplified signal of Blackmer. The motivation for doing so would have been to avoid distortion due to overloading.” (Official Action, pg. 4). However, it is respectfully submitted that if Blackmer is modified as suggested in the Official Action based upon the alleged teachings of Smith, then Blackmer will no longer operate for its intended purpose.

A stated goal of Blackmer is for improved audio signal reproduction, and in particular “enhancing the signal energy in the predetermined range of frequencies of an audio signal when the nature of the audio program suggests that such energy was present in the original program.” (col. 1, lines 6-7 and lines 37-41). Blackmer recognizes that “a great deal of the signal energy in the bass tonal range of frequencies, i.e., between about 20-50 Hz, is lost when audio signals are reproduced after recording or transmission. For greater quality and truer reproduction, it is therefore desirable to synthesize or manufacture the signal energy within this frequency range when the nature of the audio program admits, i.e., when it is likely that this energy was present in the original recorded or transmitted signal.” (emphasis added, col. 1, lines 10-19). Blackmer selects an audio signal of interest in the frequency range of 40-100 Hz. (col. 2, lines 30-32, 40-42), generates subharmonics of the signals in this frequency range (col. 2, lines 40-51), combines

these subharmonics (col. 3, lines 1-3), and adds the combined subharmonics to the original audio signal *“to provide an enhanced audio signal at the output terminal.”* (col. 3, lines 3-8). To this end, Blackmer discloses the use of a low-pass filter 38 (FIG. 2) *“to reject all energy above the upper limit of the frequencies of interest,”* which Blackmer defines, in a preferred embodiment, to be above 100 Hz. (col. 4, lines 14-17). Thus, the output of the low-pass filter is energy in the frequency range of 0 Hz to 100 Hz.

In addition, as contended in the Official Action, the first intermediate signal (i.e., the output signal from the low-pass filter 38) is multiplied by a correction factor in the gain control device 24 to generate the second intermediate signal. The correction factor is provided as a signal on a line by a qualification circuit 26. Also, the third intermediate signal is generated by amplifying the second intermediate signal at the output of the gain control device 24 by an amplification factor 52 (e.g., an adjustable resistor).

In Blackmer, a feed-forward (and not a feedback) connection exists from the output of the low-pass filter 38, through the qualification circuit 26 that comprises a series connection of a high-pass filter 44, a level detector 46, a non-linear capacitor 48, and a control amplifier 50, and then on to the gain control device 24. Blackmer discloses that the high-pass filter 44 *“rejects all signal energy below the minimum frequency of interest (in the preferred embodiment this minimum frequency being 40 Hz). The output of high pass filter 44 is therefore only signal energy from the two channels between the two frequencies of interest, 40 and 100 Hz.”* (col. 5, lines 3-8). Thus, the high-pass filter 44 is connected in series downstream from the low-pass filter 38, and the effect of these two filters is to produce a signal at the high-pass filter output in the frequency range of 40 Hz to 100 Hz. The high-pass filter output is then fed through the level detector 46, the non-linear capacitor 48 and the control amplifier 50, whose output signal

represents the output of the qualification circuit 26 that is provided as a feedforward correction factor to the gain control device 24. (FIG. 2; col. 4, lines 65-68). Blackmer teaches that the gain control device 24 *“amplifies or controls the gain of the signal output of filter 42 in proportion to the weighted control signal provided from the qualification circuit 26.”* (col. 4, lines 63-66). Further, Blackmer discloses that *“qualifying circuit 26 together with module 24 determine whether a sufficient amount of energy is present within the frequency range of interest, i.e. between 40 and 100 Hz, and to control the amount of amplification of the subharmonics generated.”* (col. 5, lines 24-28).

So the function of the qualifying circuit 26 (FIG. 1) of Blackmer is to *feedforward* a gain control signal to the gain control 24 based upon the amount of energy within the frequency range of 40 to 100 Hz. If Blackmer is modified in the Official Action to include the alleged teachings of Smith, then Blackmer will no longer *feedforward* a gain control signal to the gain control 24 based upon the amount of energy within the frequency range of 40 to 100 Hz. The Official Action contends that Blackmer can be modified with the feedback feature of Smith to meet the feature of claim 13 of *“providing the correction factor as a feedback signal that is a function of the third intermediate signal.”* (see Official Action, pg. 4). With reference to FIG. 2 of Blackmer, it can be clearly seen that the *feedforward* signal provided by the qualification circuit 26 is a function of the output signal from the low-pass filter 38, which is the first intermediate signal as contended in the Official Action. The proposed addition of a feedback signal that is a function of the third intermediate signal requires Blackmer be modified to provide the correction signal not as a function of the qualification circuit 26 (and thus not as a *“feedforward”* function of the first intermediate signal), but as a *“feedback”* function of the amplification factor 52. However, if Blackmer is modified as suggested in the Official Action, then the high-pass filter

44 is no longer available to remove undesirable frequency components below 40 Hz. As a result, Blackmer's goal of "*enhancing the signal energy in the predetermined range of frequencies of an audio signal when the nature of the audio program suggests that such energy was present in the original program*" would be vastly diminished since the predetermined range of frequencies has not been established by filtering. Also, providing the correction factor as a feedback signal as a function of the output of the amplification factor 52 removes the control of the amplification of the subharmonics through use of the correction factor signal provided to the gain control device 24. Therefore, if Blackmer is modified based upon the teachings of Smith to employ feedback control rather than feedforward control, then Blackmer will no longer function for its intended purpose.

In addition, if Blackmer is modified as suggested, then Blackmer no longer has any circuitry for determining the energy within the frequency range of interest, since the feedforward structure of Blackmer has been replaced with the feedback structure of Smith to perform the limiting. Without such circuitry Blackmer is incapable of making the fundamental decision of whether or not there is sufficient energy in the frequency range of interest. Without such an initial determination, Blackmer is incapable of determining when to add energy to the frequency range of interest. Thus, modifying Blackmer based upon the teachings of Smith results in a system that is longer operable for the intended purpose of Blackmer.

Therefore, it is respectfully requested that the obviousness rejection of claim 13 is now moot, and that claim 13 is in condition for allowance and should be passed to issuance.

Claims 24, 29 and 32

Since these independent claims currently stand rejected for the same reasons as claim 13, the arguments above with respect to claim 13 apply equally well to claims 24, 29 and 32. Therefore, it is respectfully requested that the obviousness rejection of claims 24, 29 and 32 is now moot, and that claims 24, 29 and 32 are in condition for allowance and should be passed to issuance.

23-24. The indication of allowability of claims 22-23 and 27-28 is hereby noted and appreciated.

For all the foregoing reasons, reconsideration and allowance of claims 13-32 are hereby respectfully requested.

If a telephone interview could assist in the prosecution of this application, please call the undersigned attorney.

Respectfully submitted,



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